

**$\eta_c(1S)$**  $I^G(J^{PC}) = 0^+(0^-+)$ 

NODE=M026

 **$\eta_c(1S)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2983.7 ± 0.7 OUR AVERAGE</b>		Error includes scale factor of 1.4. See the ideogram below. [2981.0 ± 1.1 MeV OUR 2012 AVERAGE Scale factor = 1.7]		
2984.3 ± 0.6 ± 0.6	1,2	ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma\eta_c$
2984.49 ± 1.16 ± 0.52	832	3 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma$ hadrons
2984.5 ± 0.8 ± 3.1	11k	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$
2985.4 ± 1.5 ± 0.5	920	2 VINOKUROVA	11 BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm\pi^\mp)$
2982.2 ± 0.4 ± 1.6	14k	4 LEES	10 BABR	$10.6 \frac{e^+e^-}{e^+e^-} \rightarrow K_S^0 K^\pm\pi^\mp$
2985.8 ± 1.5 ± 3.1	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S) K(*) \rightarrow K\bar{K}\pi K(*)$
2986.1 ± 1.0 ± 2.5	7.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow \eta_c \rightarrow \text{hadrons}$
2970 ± 5 ± 6	501	5 ABE	07 BELL	$e^+e^- \rightarrow J/\psi(c\bar{c})$
2971 ± 3 ± 2	195	WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$
2974 ± 7 ± 2	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
2981.8 ± 1.3 ± 1.5	592	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm\pi^\mp$
2984.1 ± 2.1 ± 1.0	190	6 AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2982.5 ± 0.4 ± 1.4	12k	7 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm\pi^\mp$
2982.2 ± 0.6		8 MITCHELL	09 CLEO	$e^+e^- \rightarrow \gamma X$
2982 ± 5	270	9 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
2982.5 ± 1.1 ± 0.9	2.5k	10 AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$
2977.5 ± 1.0 ± 1.2	8,11 BAI	03 BES	J/ψ → γη <sub>c</sub>	
2979.6 ± 2.3 ± 1.6	180	12 FANG	03 BELL	$B \rightarrow \eta_c K$
2976.3 ± 2.3 ± 1.2		8,13 BAI	00F BES	$J/\psi, \psi(2S) \rightarrow \gamma\eta_c$
2976.6 ± 2.9 ± 1.3	140	8,14 BAI	00F BES	$J/\psi \rightarrow \gamma\eta_c$
2980.4 ± 2.3 ± 0.6		15 BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0\pi^\mp$
2975.8 ± 3.9 ± 1.2	14 BAI	99B BES	Sup. by BAI 00F	
2999 ± 8	25	ABREU	980 DLPH	$e^+e^- \rightarrow e^+e^- + \text{hadrons}$
2988.3 ± 3.3		ARMSTRONG	95F E760	$\bar{p}p \rightarrow \gamma\gamma$
2974.4 ± 1.9	8,16 BISELLO	91 DM2	J/ψ → η <sub>c</sub> γ	
2969 ± 4 ± 4	80	8 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+K^-K^+K^-$
2956 ± 12 ± 12	8 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+K^-K_S^0 K_L^0$	OCCUR=3
2982.6 ± 2.7	12	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$
2980.2 ± 1.6		8,16 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c\gamma$
2984 ± 2.3 ± 4.0		8 GAISER	86 CBAL	$J/\psi \rightarrow \gamma X, \psi(2S) \rightarrow \gamma X$
2976 ± 8	8,17 BALTRUSAIT..84	MRK3	J/ψ → 2φγ	
2982 ± 8	18 HIMEL	80B MRK2	$e^+e^-$	
2980 ± 9	18 PARTRIDGE	80B CBAL	$e^+e^-$	

1 From a simultaneous fit to six decay modes of the  $\eta_c$ .

2 Accounts for interference with non-resonant continuum.

3 With floating width.

4 Taking into account interference with the non-resonant  $J^P = 0^-$  amplitude.5 From a fit of the  $J/\psi$  recoil mass spectrum. Supersedes ABE,K 02 and ABE 04G.6 Using mass of  $\psi(2S) = 3686.00$  MeV.

7 Not independent from the measurements reported by LEES 10.

8 MITCHELL 09 observes a significant asymmetry in the lineshapes of  $\psi(2S) \rightarrow \gamma\eta_c$  and  $J/\psi \rightarrow \gamma\eta_c$  transitions. If ignored, this asymmetry could lead to significant bias whenever the mass and width are measured in  $\psi(2S)$  or  $J/\psi$  radiative decays.

9 From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

NODE=M026M

NODE=M026M

NEW

OCCUR=2

OCCUR=2

OCCUR=2

OCCUR=3

NODE=M026M;LINKAGE=BL

NODE=M026M;LINKAGE=VA

NODE=M026M;LINKAGE=AL

NODE=M026M;LINKAGE=LE

NODE=M026M;LINKAGE=EB

NODE=M026M;LINKAGE=BG

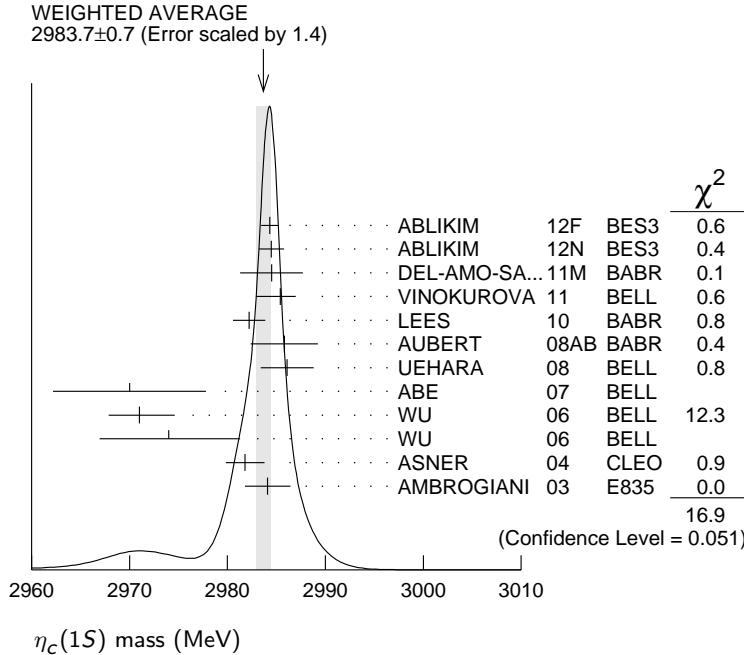
NODE=M026M;LINKAGE=DE

NODE=M026M;LINKAGE=MI

NODE=M026M;LINKAGE=AU

- 10 Superseded by LEES 10.  
 11 From a simultaneous fit of five decay modes of the  $\eta_c$ .  
 12 Superseded by VINOKUROVA 11.  
 13 Weighted average of the  $\psi(2S)$  and  $J/\psi(1S)$  samples. Using an  $\eta_c$  width of 13.2 MeV.  
 14 Average of several decay modes. Using an  $\eta_c$  width of 13.2 MeV.  
 15 Superseded by ASNER 04.  
 16 Average of several decay modes.  
 17  $\eta_c \rightarrow \phi\phi$ .  
 18 Mass adjusted by us to correspond to  $J/\psi(1S)$  mass = 3097 MeV.

NODE=M026M;LINKAGE=UB  
 NODE=M026M;LINKAGE=AK  
 NODE=M026M;LINKAGE=FA  
 NODE=M026M;LINKAGE=KZ  
 NODE=M026M;LINKAGE=C1  
 NODE=M026M;LINKAGE=NN  
 NODE=M026M;LINKAGE=A  
 NODE=M026M;LINKAGE=B  
 NODE=M026M;LINKAGE=M



$\eta_c(1S)$ WIDTH				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>32.0± 0.9 OUR FIT</b> [29.7 ± 1.0 MeV OUR 2012 FIT]				NODE=M026W
<b>32.2± 1.0 OUR AVERAGE</b> Error includes scale factor of 1.2. [29.7 ± 2.1 MeV OUR 2012 AVERAGE Scale factor = 2.0]				NODE=M026W
32.0± 1.2±1.0	1,2	ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma\eta_c$
36.4± 3.2±1.7	832	3 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma$ hadrons
36.2± 2.8±3.0	11k	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$
35.1± 3.1 <sup>+1.0</sup> <sub>-1.6</sub>	920	2 VINOKUROVA 11	BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm\pi^\mp)$
31.7± 1.2±0.8	14k	4 LEES	10 BABR	$10.6 \frac{e^+e^-}{e^+e^-} \rightarrow K_S^0 K^\pm\pi^\mp$
36.3 <sup>+ 3.7</sup> <sub>- 3.6</sub> ±4.4	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S) K^{(*)} \rightarrow K\bar{K}\pi K^{(*)}$
28.1± 3.2±2.2	7.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow \eta_c \rightarrow$ hadrons
48 <sup>+ 8</sup> <sub>- 7</sub> ±5	195	WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$
40 <sup>+ 19</sup> <sub>- 5</sub> ±5	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
24.8± 3.4±3.5	592	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm\pi^\mp$
20.4 <sup>+ 7.7</sup> <sub>- 6.7</sub> ±2.0	190	AMBROGIANI 03	E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
23.9 <sup>+ 12.6</sup> <sub>- 7.1</sub>		ARMSTRONG 95F	E760	$\bar{p}p \rightarrow \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
32.1± 1.1±1.3	12k	5 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm\pi^\mp$
34.3± 2.3±0.9	2.5k	6 AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$
17.0± 3.7±7.4		7 BAI	03 BES	$J/\psi \rightarrow \gamma\eta_c$
29 <sup>+ 8</sup> <sub>- 6</sub> ±6	180	8 FANG	03 BELL	$B \rightarrow \eta_c K$
11.0± 8.1±4.1		9 BAI	00F BES	$J/\psi \rightarrow \gamma\eta_c$ and $\psi(2S) \rightarrow \gamma\eta_c$
27.0± 5.8±1.4		10 BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$

NODE=M026W

NODE=M026W

NEW

OCCUR=2

OCCUR=2

$7.0^{+7.5}_{-7.0}$	12	BAGLIN	87B	SPEC	$\bar{p}p \rightarrow \gamma\gamma$
$10.1^{+33.0}_{-8.2}$	23	11 BALTRUSAIT..	86	MRK3	$J/\psi \rightarrow \gamma p\bar{p}$
$11.5 \pm 4.5$		GAISER	86	CBAL	$J/\psi \rightarrow \gamma X, \psi(2S) \rightarrow \gamma X$
$< 40$ 90% CL	18	HIMEL	80B	MRK2	$e^+e^-$
$< 20$ 90% CL		PARTRIDGE	80B	CBAL	$e^+e^-$

1 From a simultaneous fit to six decay modes of the  $\eta_c$ .

2 Accounts for interference with non-resonant continuum.

3 With floating mass.

4 Taking into account interference with the non-resonant  $J^P = 0^-$  amplitude.

5 Not independent from the measurements reported by LEES 10.

6 Superseded by LEES 10.

7 From a simultaneous fit of five decay modes of the  $\eta_c$ .

8 Superseded by VINOKUROVA 11.

9 From a fit to the 4-prong invariant mass in  $\psi(2S) \rightarrow \gamma\eta_c$  and  $J/\psi(1S) \rightarrow \gamma\eta_c$  decays.

10 Superseded by ASNER 04.

11 Positive and negative errors correspond to 90% confidence level.

NODE=M026W;LINKAGE=BL  
 NODE=M026W;LINKAGE=VA  
 NODE=M026W;LINKAGE=AL  
 NODE=M026W;LINKAGE=LE  
 NODE=M026W;LINKAGE=DE  
 NODE=M026W;LINKAGE=UB  
 NODE=M026W;LINKAGE=AK  
 NODE=M026W;LINKAGE=FA  
 NODE=M026W;LINKAGE=KZ  
 NODE=M026W;LINKAGE=NN  
 NODE=M026W;LINKAGE=L

NODE=M026215;NODE=M026

### $\eta_c(1S)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
<b>Decays involving hadronic resonances</b>		
$\Gamma_1 \eta'(958)\pi\pi$	( 4.1 $\pm 1.7$ ) %	
$\Gamma_2 \rho\rho$	( 1.8 $\pm 0.5$ ) %	
$\Gamma_3 K^*(892)^0 K^- \pi^+ + \text{c.c.}$	( 2.0 $\pm 0.7$ ) %	
$\Gamma_4 K^*(892)\bar{K}^*(892)$	( 7.1 $\pm 1.3$ ) $\times 10^{-3}$	
$\Gamma_5 K^{*0}\bar{K}^{*0}\pi^+\pi^-$	( 1.1 $\pm 0.5$ ) %	
$\Gamma_6 \phi K^+ K^-$	( 2.9 $\pm 1.4$ ) $\times 10^{-3}$	
$\Gamma_7 \phi\phi$	( 1.76 $\pm 0.20$ ) $\times 10^{-3}$	
$\Gamma_8 \phi 2(\pi^+\pi^-)$	< 3.5 $\times 10^{-3}$	90%
$\Gamma_9 a_0(980)\pi$	< 2 %	90%
$\Gamma_{10} a_2(1320)\pi$	< 2 %	90%
$\Gamma_{11} K^*(892)\bar{K}^+ + \text{c.c.}$	< 1.28 %	90%
$\Gamma_{12} f_2(1270)\eta$	< 1.1 %	90%
$\Gamma_{13} \omega\omega$	< 3.1 $\times 10^{-3}$	90%
$\Gamma_{14} \omega\phi$	< 1.7 $\times 10^{-3}$	90%
$\Gamma_{15} f_2(1270)f_2(1270)$	( 9.8 $\pm 2.5$ ) $\times 10^{-3}$	
$\Gamma_{16} f_2(1270)f'_2(1525)$	( 9.7 $\pm 3.2$ ) $\times 10^{-3}$	

### Decays into stable hadrons

$\Gamma_{17} K\bar{K}\pi$	( 7.3 $\pm 0.5$ ) %
$\Gamma_{18} \eta\pi^+\pi^-$	( 1.7 $\pm 0.5$ ) %
$\Gamma_{19} \eta 2(\pi^+\pi^-)$	( 4.4 $\pm 1.3$ ) %
$\Gamma_{20} K^+ K^- \pi^+ \pi^-$	( 6.9 $\pm 1.1$ ) $\times 10^{-3}$
$\Gamma_{21} K^+ K^- \pi^+ \pi^- \pi^0$	( 3.5 $\pm 0.6$ ) %
$\Gamma_{22} K^0 K^- \pi^+ \pi^- \pi^+ + \text{c.c.}$	( 5.6 $\pm 1.5$ ) %
$\Gamma_{23} K^+ K^- 2(\pi^+\pi^-)$	( 7.5 $\pm 2.4$ ) $\times 10^{-3}$
$\Gamma_{24} 2(K^+ K^-)$	( 1.47 $\pm 0.31$ ) $\times 10^{-3}$
$\Gamma_{25} \pi^+\pi^-\pi^0\pi^0$	( 4.7 $\pm 1.0$ ) %
$\Gamma_{26} 2(\pi^+\pi^-)$	( 9.7 $\pm 1.2$ ) $\times 10^{-3}$
$\Gamma_{27} 2(\pi^+\pi^-\pi^0)$	( 17.4 $\pm 3.3$ ) %
$\Gamma_{28} 3(\pi^+\pi^-)$	( 1.7 $\pm 0.4$ ) %
$\Gamma_{29} p\bar{p}$	( 1.51 $\pm 0.16$ ) $\times 10^{-3}$
$\Gamma_{30} p\bar{p}\pi^0$	( 3.6 $\pm 1.3$ ) $\times 10^{-3}$
$\Gamma_{31} \Lambda\bar{\Lambda}$	( 1.09 $\pm 0.24$ ) $\times 10^{-3}$
$\Gamma_{32} K\bar{K}\eta$	( 10 $\pm 5$ ) $\times 10^{-3}$
$\Gamma_{33} \pi^+\pi^- p\bar{p}$	( 5.3 $\pm 1.8$ ) $\times 10^{-3}$

### Radiative decays

$\Gamma_{34} \gamma\gamma$	( 1.57 $\pm 0.12$ ) $\times 10^{-4}$
----------------------------	--------------------------------------

NODE=M026;CLUMP=B

DESIG=14

DESIG=16

DESIG=61

DESIG=15

DESIG=60

DESIG=62

DESIG=55

DESIG=27

DESIG=63

DESIG=11

DESIG=64

DESIG=56

DESIG=12

DESIG=65

DESIG=45

DESIG=25

DESIG=13

NODE=M026;CLUMP=C

DESIG=31

**Charge conjugation (*C*), Parity (*P*),  
Lepton family number (*LF*) violating modes**

NODE=M026;CLUMP=D

$\Gamma_{35}$	$\pi^+ \pi^-$	$P, CP < 1.1$	$\times 10^{-4}$	90%	DESIG=51
$\Gamma_{36}$	$\pi^0 \pi^0$	$P, CP < 3.5$	$\times 10^{-5}$	90%	DESIG=52
$\Gamma_{37}$	$K^+ K^-$	$P, CP < 6$	$\times 10^{-4}$	90%	DESIG=53
$\Gamma_{38}$	$K_S^0 K_S^0$	$P, CP < 3.1$	$\times 10^{-4}$	90%	DESIG=54

**CONSTRAINED FIT INFORMATION**

An overall fit to the total width, 8 combinations of partial widths obtained from integrated cross section, and 17 branching ratios uses 79 measurements and one constraint to determine 12 parameters. The overall fit has a  $\chi^2 = 112.1$  for 68 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients  $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$ , in percent, from the fit to parameters  $p_i$ , including the branching fractions,  $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$ . The fit constrains the  $x_i$  whose labels appear in this array to sum to one.

$x_7$	18										
$x_{15}$	3	6									
$x_{17}$	22	42	7								
$x_{20}$	11	21	4	25							
$x_{24}$	9	16	3	25	10						
$x_{26}$	14	25	5	31	16	12					
$x_{29}$	14	26	5	36	16	13	20				
$x_{31}$	3	6	1	9	4	3	5	25			
$x_{34}$	-29	-54	-10	-66	-34	-27	-41	-45	-11		
$\Gamma$	-2	-3	-1	-4	-2	-2	-2	7	2	-29	
	$x_4$	$x_7$	$x_{15}$	$x_{17}$	$x_{20}$	$x_{24}$	$x_{26}$	$x_{29}$	$x_{31}$	$x_{34}$	

Mode	Rate (MeV)	
$\Gamma_4$ $K^*(892) \bar{K}^*(892)$	0.23 $\pm 0.04$	DESIG=18
$\Gamma_7$ $\phi \phi$	0.056 $\pm 0.007$	DESIG=17
$\Gamma_{15}$ $f_2(1270) f_2(1270)$	0.31 $\pm 0.08$	DESIG=46
$\Gamma_{17}$ $K \bar{K} \pi$	2.35 $\pm 0.17$	DESIG=14
$\Gamma_{20}$ $K^+ K^- \pi^+ \pi^-$	0.222 $\pm 0.035$	DESIG=15
$\Gamma_{24}$ $2(K^+ K^-)$	0.047 $\pm 0.010$	DESIG=27
$\Gamma_{26}$ $2(\pi^+ \pi^-)$	0.31 $\pm 0.04$	DESIG=11
$\Gamma_{29}$ $p \bar{p}$	0.049 $\pm 0.005$	DESIG=12
$\Gamma_{31}$ $\Lambda \bar{\Lambda}$	0.035 $\pm 0.008$	DESIG=45
$\Gamma_{34}$ $\gamma \gamma$	0.0050 $\pm 0.0004$	DESIG=31

**$\eta_c(1S)$  PARTIAL WIDTHS**

**Γ<sub>34</sub>**

NODE=M026217

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.0 ± 0.4 OUR FIT</b> [5.3 ± 0.5 keV OUR 2012 FIT]				

NODE=M026W1

NODE=M026W1

NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.2 ± 1.2	273 ± 43	1,2 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
5.5 ± 1.2 ± 1.8	157 ± 33	3 KUO	05 BELL	$\gamma\gamma \rightarrow p\bar{p}$
7.4 ± 0.4 ± 2.3		4 ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
13.9 ± 2.0 ± 3.0	41	5 ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow \eta_c$
3.8 ± 1.1 ± 1.9	190	6 AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
7.6 ± 0.8 ± 2.3		4,7 BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$
6.9 ± 1.7 ± 2.1	76	8 ACCIARRI	99T L3	$e^+ e^- \rightarrow e^+ e^- \eta_c$
27 ± 16 ± 10	5	4 SHIRAI	98 AMY	$58 e^+ e^-$

$6.7 \pm 2.4$	$1.7 \pm 2.3$	<sup>3</sup> ARMSTRONG 95F E760	$\bar{p}p \rightarrow \gamma\gamma$
$11.3 \pm 4.2$		<sup>9</sup> ALBRECHT 94H ARG	$e^+e^- \rightarrow e^+e^-\eta_c$
$8.0 \pm 2.3 \pm 2.4$	17	<sup>10</sup> ADRIANI 93N L3	$e^+e^- \rightarrow e^+e^-\eta_c$
$5.9 \pm 2.1 \pm 1.9$		<sup>6</sup> CHEN 90B CLEO	$e^+e^- \rightarrow e^+e^-\eta_c$
$6.4 \pm 5.0$	$3.4 \pm 3.4$	<sup>11</sup> AIHARA 88D TPC	$e^+e^- \rightarrow e^+e^-X$
$4.3 \pm 3.4$	$3.7 \pm 2.4$	<sup>3</sup> BAGLIN 87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$
28 ± 15		<sup>4,12</sup> BERGER 86 PLUT	$\gamma\gamma \rightarrow K\bar{K}\pi$

<sup>1</sup> Calculated by us using  $\Gamma(\eta_c \rightarrow K\bar{K}\pi) \times \Gamma(\eta_c \rightarrow \gamma\gamma) / \Gamma = 0.44 \pm 0.05$  keV from PDG 06 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (8.5 \pm 1.8)\%$  from AUBERT 06E.

<sup>2</sup> Systematic errors not evaluated.

<sup>3</sup> Normalized to  $B(\eta_c \rightarrow p\bar{p}) = (1.3 \pm 0.4) \times 10^{-3}$ .

<sup>4</sup> Normalized to  $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$ .

<sup>5</sup> Average of  $K_S^0 K^\pm \pi^\mp$ ,  $\pi^+ \pi^- K^+ K^-$ , and  $2(K^+ K^-)$  decay modes.

<sup>6</sup> Normalized to the sum of  $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$ ,  $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$ , and  $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$ .

<sup>7</sup> Superseded by ASNER 04.

<sup>8</sup> Normalized to the sum of 9 branching ratios.

<sup>9</sup> Normalized to the sum of  $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$ ,  $B(\eta_c \rightarrow \phi\phi)$ ,  $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$ , and  $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$ .

<sup>10</sup> Superseded by ACCIARRI 99T.

<sup>11</sup> Normalized to the sum of  $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$ ,  $B(\eta_c \rightarrow 2K^+ 2K^-)$ ,  $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$ , and  $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$ .

<sup>12</sup> Re-evaluated by AIHARA 88D.

### $\eta_c(1S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_{34}/\Gamma$				
VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<39	90	< 1556	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+ \pi^-)$

$\Gamma(K^*(892)\bar{K}^*(892)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_4\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>35 ± 6 OUR FIT</b> [ $36 \pm 6$ eV OUR 2012 FIT]				
<b>32.4±4.2±5.8</b>	$882 \pm 115$	UEHARA	08	BELL $\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_7\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>8.9 ± 0.8 OUR FIT</b> [ $10.2 \pm 1.4$ eV OUR 2012 FIT]				
<b>7.8 ± 0.9 OUR AVERAGE</b> [ $6.8 \pm 1.8$ eV OUR 2012 AVERAGE]				

<b>7.75±0.66±0.62</b>	$386 \pm 31$	<sup>1</sup> LIU	12B BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
6.8 ± 1.2 ± 1.3	$132 \pm 23$	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(K^+ K^-)$

<sup>1</sup> Supersedes UEHARA 08. Using  $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$ .

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{13}\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>8.67±2.86±0.96</b>	$85 \pm 29$	<sup>1</sup> LIU	12B BELL	$\gamma\gamma \rightarrow 2(\pi^+ \pi^- \pi^0)$
<sup>1</sup> Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$ .				

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{14}\Gamma_{34}/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.49	90	<sup>1</sup> LIU	12B BELL	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

<sup>1</sup> Using  $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$  and  $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$ .

$\Gamma(f_2(1270)f_2(1270)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{15}\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>49±13 OUR FIT</b> [ $51 \pm 13$ eV OUR 2012 FIT]				
<b>69±17±12</b>	$3182 \pm 766$	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+ \pi^-)$

NODE=M026W1;LINKAGE=AU

NODE=M026W1;LINKAGE=NS

NODE=M026W1;LINKAGE=N3

NODE=M026W1;LINKAGE=N2

NODE=M026W;LINKAGE=FF

NODE=M026W1;LINKAGE=N6

NODE=M026W1;LINKAGE=NN

NODE=M026W1;LINKAGE=N1

NODE=M026W1;LINKAGE=N5

NODE=M026W1;LINKAGE=WD

NODE=M026W1;LINKAGE=N4

NODE=M026W1;LINKAGE=A

NODE=M026220

NODE=M026G09

NODE=M026G09

NODE=M026G08

NODE=M026G08

NEW

NODE=M026G07

NODE=M026G07

NEW

NODE=M026G07;LINKAGE=LI

NODE=M026G03

NODE=M026G03

NODE=M026G03;LINKAGE=LI

NODE=M026G04

NODE=M026G04

NODE=M026G04;LINKAGE=LI

NODE=M026G19

NODE=M026G19

NEW

$\Gamma(f_2(1270)f'_2(1525)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{16}\Gamma_{34}/\Gamma$
<b>49 ± 9 ± 13</b>	$1128 \pm 206$	UEHARA	08	BELL	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$

 $\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (keV)	CL% EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{17}\Gamma_{34}/\Gamma$
-------------	----------	-------------	------	---------	---------------------------------

**0.369 ± 0.021 OUR FIT**[ $0.377 \pm 0.021$  keV OUR 2012 FIT]**0.407 ± 0.027 OUR AVERAGE** Error includes scale factor of 1.2.

$0.374 \pm 0.009 \pm 0.031$	14k	<sup>1</sup> LEES	10	BABR	$10.6 e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm \pi^\mp$
$0.407 \pm 0.022 \pm 0.028$		2,3 ASNER	04	CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
$0.60 \pm 0.12 \pm 0.09$	41	3,4 ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
$1.47 \pm 0.87 \pm 0.27$		3 SHIRAI	98	AMY	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$
$0.84 \pm 0.21$		3 ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow K^\pm K_S^0 \pi^\mp$
$0.60 \pm 0.23 \pm 0.20$		3 CHEN	90B	CLEO	$\gamma\gamma \rightarrow \eta_c K^\pm K_S^0 \pi^\mp$
$1.06 \pm 0.41 \pm 0.27$	11	3 BRAUNSCH...	89	TASS	$\gamma\gamma \rightarrow K\bar{K}\pi$
$1.5 \pm 0.60 \pm 0.3$	7	3 BERGER	86	PLUT	$\gamma\gamma \rightarrow K\bar{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.386 \pm 0.008 \pm 0.021$	12k	<sup>5</sup> DEL-AMO-SA..11M BABR			$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
$0.418 \pm 0.044 \pm 0.022$		3,6 BRANDENB...	00B	CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$
<0.63	95	3 BEHREND	89	CELL	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
<4.4	95	ALTHOFF	85B	TASS	$\gamma\gamma \rightarrow K\bar{K}\pi$

<sup>1</sup> From the corrected and unfolded mass spectrum.<sup>2</sup> Calculated by us from the value reported in ASNER 04 that assumes  $B(\eta_c \rightarrow K\bar{K}\pi) = 5.5 \pm 1.7\%$ <sup>3</sup> We have multiplied  $K^\pm K_S^0 \pi^\mp$  measurement by 3 to obtain  $K\bar{K}\pi$ .<sup>4</sup> Calculated by us from the value reported in ABDALLAH 03J, which uses  $B(\eta_c \rightarrow K_S^0 K^\pm \pi^\mp) = (1.5 \pm 0.4)\%$ .<sup>5</sup> Not independent from the measurements reported by LEES 10.

6 Superseded by ASNER 04.

 $\Gamma(K^+ K^- \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{20}\Gamma_{34}/\Gamma$
------------	------	-------------	------	---------	---------------------------------

**35 ± 5 OUR FIT**[ $32 \pm 6$  eV OUR 2012 FIT]**27 ± 6 OUR AVERAGE**

$25.7 \pm 3.2 \pm 4.9$	$2019 \pm 248$	UEHARA	08	BELL	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$
$280 \pm 100 \pm 60$	42	<sup>1</sup> ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$
$170 \pm 80 \pm 20$	$13.9 \pm 6.6$	ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$

<sup>1</sup> Calculated by us from the value reported in ABDALLAH 03J, which uses  $B(\eta_c \rightarrow \pi^+ \pi^- K^+ K^-) = (2.0 \pm 0.7)\%$ . $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{21}\Gamma_{34}/\Gamma$
-------------	------	-------------	------	---------	---------------------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.190 \pm 0.006 \pm 0.028$	11k	<sup>1</sup> DEL-AMO-SA..11M BABR			$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
-----------------------------	-----	-----------------------------------	--	--	--

<sup>1</sup> Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M. $\Gamma(2(K^+ K^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{24}\Gamma_{34}/\Gamma$
------------	------	-------------	------	---------	---------------------------------

**7.4 ± 1.5 OUR FIT**[ $7.0 \pm 1.6$  eV OUR 2012 FIT]**5.8 ± 1.9 OUR AVERAGE**

$5.6 \pm 1.1 \pm 1.6$	$216 \pm 42$	UEHARA	08	BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$
$350 \pm 90 \pm 60$	46	<sup>1</sup> ABDALLAH	03J	DLPH	$\gamma\gamma \rightarrow 2(K^+ K^-)$
$231 \pm 90 \pm 23$	$9.1 \pm 3.3$	<sup>2</sup> ALBRECHT	94H	ARG	$\gamma\gamma \rightarrow 2(K^+ K^-)$

<sup>1</sup> Calculated by us from the value reported in ABDALLAH 03J, which uses  $B(\eta_c \rightarrow 2(K^+ K^-)) = (2.1 \pm 1.2)\%$ .<sup>2</sup> Includes all topological modes except  $\eta_c \rightarrow \phi\phi$ .

NODE=M026G20

NODE=M026G20

NODE=M026G14

NODE=M026G14

NEW

NODE=M026G14;LINKAGE=LE

NODE=M026G14;LINKAGE=AA

NODE=M026G14;LINKAGE=C

NODE=M026G;LINKAGE=BB

NODE=M026G14;LINKAGE=DE

NODE=M026G14;LINKAGE=NN

NODE=M026G15

NODE=M026G15

NEW

NODE=M026G;LINKAGE=CC

NODE=M026G02

NODE=M026G02

NODE=M026G02;LINKAGE=DE

NODE=M026G27

NODE=M026G27

NEW

NODE=M026G;LINKAGE=DD

NODE=M026G;LINKAGE=EE

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (eV) EVTS

**49 ± 6 OUR FIT**

[45 ± 6 eV OUR 2012 FIT]

**42 ± 6 OUR AVERAGE**40.7 ± 3.7 ± 5.3      5381 ± 492  
180 ± 70 ± 20      21.4 ± 8.6

DOCUMENT ID TECN COMMENT

UEHARA 08 BELL  $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$   
ALBRECHT 94H ARG  $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$  $\Gamma_{26}\Gamma_{34}/\Gamma$ 

NODE=M026G11

NODE=M026G11

NEW

 $\Gamma(p\bar{p}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ 

VALUE (eV) EVTS

**7.6 ± 0.8 OUR FIT**

[7.4 ± 0.8 eV OUR 2012 FIT]

**7.20 ± 1.53 ± 0.67**

157 ± 33

DOCUMENT ID TECN COMMENT

 $\Gamma_{29}\Gamma_{34}/\Gamma$ 

NODE=M026G01

NODE=M026G01

NEW

4.6 +1.3  
-1.1 ± 0.4

190

1 AMBROGIANI 03 E835  $\bar{p}p \rightarrow \gamma\gamma$ 8.1 +2.9  
-2.01 ARMSTRONG 95F E760  $\bar{p}p \rightarrow \gamma\gamma$ 1 Not independent from the  $\Gamma_{\gamma\gamma}$  reported by the same experiment. $\eta_c(1S)$  BRANCHING RATIOS

## — HADRONIC DECAYS —

 $\Gamma(\eta'(958)\pi\pi)/\Gamma_{\text{total}}$ 

VALUE EVTS

**0.041 ± 0.017**

14

DOCUMENT ID TECN COMMENT

 $\Gamma_1/\Gamma$ 1 BALTRUSAIT..86 MRK3  $J/\psi \rightarrow \eta_c\gamma$ 1 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . $\Gamma(\rho\rho)/\Gamma_{\text{total}}$ VALUE (units  $10^{-3}$ ) CL% EVTS**18 ± 5 OUR AVERAGE**

12.6 ± 3.8 ± 5.1

14

DOCUMENT ID TECN COMMENT

 $\Gamma_2/\Gamma$ 

26.0 ± 2.4 ± 8.8

113

1 ABLIKIM 05L BES2  $J/\psi \rightarrow \pi^+\pi^-\pi^+\pi^-\gamma$ 

23.6 ± 10.6 ± 8.2

32

1 BISELLO 91 DM2  $J/\psi \rightarrow \gamma\rho^0\rho^0$ 

• • • We do not use the following data for averages, fits, limits, etc. • • •

&lt;14

90

1 BISELLO 91 DM2  $J/\psi \rightarrow \gamma\rho^+\rho^-$ 1 BALTRUSAIT..86 MRK3  $J/\psi \rightarrow \eta_c\gamma$ 1 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages. $\Gamma(K^*(892)^0 K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ 

VALUE EVTS

**0.02 ± 0.007**

63

DOCUMENT ID TECN COMMENT

 $\Gamma_3/\Gamma$ 1.2 BALTRUSAIT..86 MRK3  $J/\psi \rightarrow \eta_c\gamma$ 

1 BALTRUSAITIS 86 has an error according to Partridge.

2 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . $\Gamma(K^*(892)\bar{K}^*(892))/\Gamma_{\text{total}}$ VALUE (units  $10^{-4}$ ) EVTS**71 ± 13 OUR FIT**[(68 ± 13) × 10<sup>-4</sup> OUR 2012 FIT]**91 ± 26 OUR AVERAGE**

108 ± 25 ± 44

60

1 ABLIKIM 05L BES2  $J/\psi \rightarrow K^+ K^- \pi^+ \pi^- \gamma$ 

82 ± 28 ± 27

14

1 BISELLO 91 DM2  $e^+ e^- \rightarrow \gamma K^+ K^- \pi^+ \pi^-$ 

90 ± 50

9

1 BALTRUSAIT..86 MRK3  $J/\psi \rightarrow \eta_c\gamma$ 1 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages. $\Gamma(K^{*0}\bar{K}^{*0}\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units  $10^{-4}$ ) EVTS**112 ± 47 ± 25**

45

DOCUMENT ID TECN COMMENT

 $\Gamma_5/\Gamma$ 1 ABLIKIM 06A BES2  $J/\psi \rightarrow K^{*0}\bar{K}^{*0}\pi^+\pi^- \gamma$ 1 ABLIKIM 06A reports  $[\Gamma(\eta_c(1S) \rightarrow K^{*0}\bar{K}^{*0}\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (1.91 \pm 0.64 \pm 0.48) \times 10^{-4}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M026R14

NODE=M026R14

NEW

NODE=M026R14;LINKAGE=GG

NODE=M026225

NODE=M026305

NODE=M026R14

NODE=M026R14

NODE=M026R14;LINKAGE=E

NODE=M026R9

NODE=M026R9

OCCUR=2

NODE=M026R9;LINKAGE=E

NODE=M026R16

NODE=M026R16

NODE=M026R;LINKAGE=03

NODE=M026R16;LINKAGE=E

NODE=M026R8

NODE=M026R8

NEW

NODE=M026R8;LINKAGE=E

NODE=M026R25

NODE=M026R25

NODE=M026R25;LINKAGE=AB

$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$	$\Gamma_6/\Gamma$				
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b><math>2.9^{+0.9}_{-0.8} \pm 1.1</math></b>	$14.1^{+4.4}_{-3.7}$	<sup>1</sup> HUANG	03	BELL	$B^+ \rightarrow (\phi K^+ K^-) K^+$

<sup>1</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$	$\Gamma_7/\Gamma$				
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b><math>17.6 \pm 2.0</math> OUR FIT</b>					$\Gamma_7/\Gamma$
$[(19.4 \pm 3.0) \times 10^{-4}$ OUR 2012 FIT]					
<b>30 <math>\pm</math> 5 OUR AVERAGE</b>					
25.3 $\pm$ 5.1 $\pm$ 9.1	72	<sup>1</sup> ABLIKIM	05L	BES2	$J/\psi \rightarrow K^+ K^- K^+ K^- \gamma$
26 $\pm$ 9	$357 \pm 64$	<sup>1</sup> BAI	04	BES	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
31 $\pm$ 7 $\pm$ 10	19	<sup>1</sup> BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
30 $\pm$ 18 $\pm$ 10	5	<sup>1</sup> BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$
74 $\pm$ 18 $\pm$ 24	80	<sup>1</sup> BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
67 $\pm$ 21 $\pm$ 24		<sup>1</sup> BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

18 $\pm$ 8 $\pm$ 7	$7.0^{+3.0}_{-2.3}$	<sup>2</sup> HUANG	03	BELL	$B^+ \rightarrow (\phi\phi) K^+$
--------------------	---------------------	--------------------	----	------	----------------------------------

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

<sup>2</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

$\Gamma(\phi\phi)/\Gamma(K\bar{K}\pi)$	$\Gamma_7/\Gamma_{17}$				
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b>0.0240 <math>\pm</math> 0.0026 OUR FIT</b>					$\Gamma_7/\Gamma_{17}$
[0.027 $\pm$ 0.004 OUR 2012 FIT]					

<b>0.044 <math>\pm</math> 0.012 OUR AVERAGE</b>					$\Gamma_7/\Gamma_{17}$
0.055 $\pm$ 0.014 $\pm$ 0.005		AUBERT,B	04B	BABR	$B^\pm \rightarrow K^\pm \eta_c$
0.032 $\pm$ 0.014 $\pm$ 0.009	7	<sup>1</sup> HUANG	03	BELL	$B^\pm \rightarrow K^\pm \phi\phi$

<sup>1</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

$\Gamma(\phi 2(\pi^+\pi^-))/\Gamma_{\text{total}}$	$\Gamma_8/\Gamma$				
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b>&lt;35</b>	90	<sup>1</sup> ABLIKIM	06A	BES2	$J/\psi \rightarrow \phi 2(\pi^+\pi^-)\gamma$
---------------	----	----------------------	-----	------	---

<sup>1</sup> ABLIKIM 06A reports  $[\Gamma(\eta_c(1S) \rightarrow \phi 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] < 0.603 \times 10^{-4}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$ .

$\Gamma(a_0(980)\pi)/\Gamma_{\text{total}}$	$\Gamma_9/\Gamma$				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b>&lt;0.02</b>	90	1,2 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
-----------------	----	--------------------	------	------------------------------------

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

<sup>2</sup> We are assuming  $B(a_0(980) \rightarrow \eta\pi) > 0.5$ .

$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$	$\Gamma_{10}/\Gamma$				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b>&lt;0.02</b>	90	<sup>1</sup> BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
-----------------	----	-----------------------------	------	------------------------------------

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

$\Gamma(K^*(892)\bar{K} + \text{c.c.})/\Gamma_{\text{total}}$	$\Gamma_{11}/\Gamma$				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<b>&lt;0.0128</b>	90	BISELLO	91	DM2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
-------------------	----	---------	----	-----	---

<b>&lt;0.0132</b>	90	<sup>1</sup> BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
-------------------	----	----------------------	----	-----	---

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

NODE=M026R21

NODE=M026R21

NODE=M026R7

NODE=M026R7

NEW

OCCUR=2

OCCUR=3

NODE=M026R39

NODE=M026R39

NODE=M026R39;LINKAGE=BB

NODE=M026R26

NODE=M026R26

NODE=M026R26;LINKAGE=AB

NODE=M026R11

NODE=M026R11

NODE=M026R11;LINKAGE=E

NODE=M026R11;LINKAGE=F

NODE=M026R12

NODE=M026R12

NODE=M026R12;LINKAGE=E

NODE=M026R17

NODE=M026R17

OCCUR=2

NODE=M026R17;LINKAGE=E

$\Gamma(f_2(1270)\eta)/\Gamma_{\text{total}}$					$\Gamma_{12}/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.011	90	1 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

$\Gamma(\omega\omega)/\Gamma_{\text{total}}$					$\Gamma_{13}/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.0031	90	1 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.0063	90	1 ABLIKIM	05L	$BES2 \rightarrow \pi^+ \pi^- \pi^0 \pi^+ \pi^- \pi^0 \gamma$	
<0.0063	1	BISELLO	91	$DM2 \rightarrow J/\psi \rightarrow \gamma \omega \omega$	

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\omega\phi)/\Gamma_{\text{total}}$					$\Gamma_{14}/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.0017	90	1 ABLIKIM	05L	$BES2 \rightarrow \pi^+ \pi^- \pi^0 K^+ K^- \gamma$	

<sup>1</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

$\Gamma(f_2(1270)f_2(1270))/\Gamma_{\text{total}}$					$\Gamma_{15}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>0.98 ± 0.25 OUR FIT</b>					

$[(0.97 \pm 0.25) \times 10^{-2} \text{ OUR 2012 FIT}]$

**0.77 ± 0.30 OUR AVERAGE**  $[(0.76^{+0.30}_{-0.34}) \times 10^{-2} \text{ OUR 2012 AVERAGE}]$

**0.77 ± 0.25 ± 0.17**  $91.2 \pm 19.8 \quad 1 \text{ ABLIKIM} \quad 04M \text{ BES} \quad J/\psi \rightarrow \gamma_2 \pi^+ 2\pi^-$

<sup>1</sup> ABLIKIM 04M reports  $[\Gamma(\eta_c(1S) \rightarrow f_2(1270)f_2(1270))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (1.3 \pm 0.3^{+0.3}_{-0.4}) \times 10^{-4}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$					$\Gamma_{17}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>7.3 ± 0.5 OUR FIT</b>					

$[(7.2 \pm 0.6) \times 10^{-2} \text{ OUR 2012 FIT}]$

**6.5 ± 0.6 OUR AVERAGE**

$[(6.1 \pm 0.8) \times 10^{-2} \text{ OUR 2012 AVERAGE}]$

6.3 ± 1.3 ± 0.6	55	1,2 ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- \pi^0$
7.9 ± 1.4 ± 0.7	107	3,4 ABLIKIM	12N	BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^\mp \pi^\pm$
8.5 ± 1.8		5 AUBERT	06E	BABR	$B^\pm \rightarrow K^\pm X c \bar{c}$
5.1 ± 2.1	0.6k	6 BAI	04	BES	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$
6.90 ± 1.42 ± 1.32	33	6 BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
5.43 ± 0.94 ± 0.94	68	6 BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$
4.8 ± 1.7	95	6,7 BALTRUSAIT..86	MRK3		$J/\psi \rightarrow \eta_c \gamma$
16.1 ± 9.2		8.9 HIMEL	80B	MRK2	$\psi(2S) \rightarrow \eta_c \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 10.7 90% CL 6,10 PARTRIDGE 80B CBAL  $J/\psi \rightarrow \eta_c \gamma$

<sup>1</sup> ABLIKIM 12N quotes  $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K^+ K^- \pi^0) = (4.54 \pm 0.76 \pm 0.48) \times 10^{-6}$  which we multiply by 6 to account for isospin symmetry.

<sup>2</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (27.24 \pm 4.56 \pm 2.88) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>3</sup> ABLIKIM 12N quotes  $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K_S^0 K^\pm \pi^\mp) = (11.35 \pm 1.25 \pm 1.50) \times 10^{-6}$  which we multiply by 3 to account for isospin symmetry.

<sup>4</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M026R13  
NODE=M026R13

NODE=M026R10;LINKAGE=E  
NODE=M026R10  
NODE=M026R10

NODE=M026R10;LINKAGE=E  
NODE=M026R10

NODE=M026R22  
NODE=M026R22

NODE=M026R22;LINKAGE=E  
NODE=M026R19  
NODE=M026R19  
NEW

NEW  
NODE=M026R19;LINKAGE=AB

NODE=M026R4  
NODE=M026R4  
NEW

NEW  
OCCUR=2  
OCCUR=2

NODE=M026R4;LINKAGE=BK

NODE=M026R4;LINKAGE=CK

NODE=M026R4;LINKAGE=BL

NODE=M026R4;LINKAGE=CL

<sup>5</sup> Determined from the ratio of  $B(B^\pm \rightarrow K^\pm \eta_c) B(\eta_c \rightarrow K\bar{K}\pi) = (7.4 \pm 0.5 \pm 0.7) \times 10^{-5}$  reported in AUBERT, B 04B and  $B(B^\pm \rightarrow K^\pm \eta_c) = (8.7 \pm 1.5) \times 10^{-3}$  reported in AUBERT 06E.

<sup>6</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

<sup>7</sup> Average from  $K^+ K^- \pi^0$  and  $K^\pm K_S^0 \pi^\mp$  decay channels.

<sup>8</sup>  $K^\pm K_S^0 \pi^\mp$  corrected to  $K\bar{K}\pi$  by factor 3. KS, MR.

<sup>9</sup> Estimated using  $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$ .

<sup>10</sup>  $K^+ K^- \pi^0$  corrected to  $K\bar{K}\pi$  by factor 6. KS, MR

$\Gamma(\phi K^+ K^-)/\Gamma(K\bar{K}\pi)$		$\Gamma_6/\Gamma_{17}$		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.052<sup>+0.016</sup><sub>-0.014</sub><sup>±0.014</sup></b>	7	<sup>1</sup> HUANG	03 BELL	$B^\pm \rightarrow K^\pm \phi\phi$

<sup>1</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$		$\Gamma_{18}/\Gamma$		
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.7<sup>±0.5</sup> OUR AVERAGE</b>	[ $0.047 \pm 0.015$ OUR 2012 AVERAGE]			

<b>1.7<sup>±0.4</sup><sub>-0.1</sub><sup>±0.1</sup></b>	33	<sup>1</sup> ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta\pi^+\pi^-$
<b>• • •</b> We do not use the following data for averages, fits, limits, etc. <b>• • •</b>				
5.4 $\pm 2.0$	75	<sup>2</sup> BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
3.7 $\pm 1.3 \pm 2.0$	18	<sup>2</sup> PARTRIDGE	80B CBAL	$J/\psi \rightarrow \eta\pi^+\pi^-\gamma$

<sup>1</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (7.22 \pm 1.47 \pm 1.11) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\eta 2(\pi^+\pi^-))/\Gamma_{\text{total}}$		$\Gamma_{19}/\Gamma$		
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.4<sup>±1.2</sup><sub>-0.4</sub><sup>±0.4</sup></b>	39	<sup>1</sup> ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta 2(\pi^+\pi^-)$

<sup>1</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow \eta 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (19.17 \pm 3.77 \pm 3.72) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$		$\Gamma_{20}/\Gamma$		
VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>6.9<sup>± 1.1</sup> OUR FIT</b>				

[ $0.0061 \pm 0.0012$ OUR 2012 FIT]				
<b>11.2<sup>± 1.9</sup> OUR AVERAGE</b>				

[ $0.0142 \pm 0.0033$ OUR 2012 AVERAGE]				
9.7 $\pm 2.2 \pm 0.9$	38	<sup>1</sup> ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- \pi^+ \pi^-$
12 $\pm 4$	0.4k	<sup>2</sup> BAI	04 BES	$J/\psi \rightarrow \gamma K^+ K^- \pi^+ \pi^-$
21 $\pm 7$	110	<sup>2</sup> BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
14 $^{+22}_{-9}$	3	HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$

<sup>1</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (4.16 \pm 0.76 \pm 0.59) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

<sup>3</sup> Estimated using  $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$ .

NODE=M026R4;LINKAGE=AB

NODE=M026R4;LINKAGE=E

NODE=M026R4;LINKAGE=D

NODE=M026R4;LINKAGE=01

NODE=M026R4;LINKAGE=A

NODE=M026R4;LINKAGE=02

NODE=M026R02  
NODE=M026R02

NODE=M026R02;LINKAGE=BB

NODE=M026R6  
NODE=M026R6

NEW

NODE=M026R6;LINKAGE=AB

NODE=M026R6;LINKAGE=E

NODE=M026R05  
NODE=M026R05

NODE=M026R05;LINKAGE=AB

NODE=M026R5  
NODE=M026R5

NEW

NEW

NODE=M026R5;LINKAGE=AB

NODE=M026R5;LINKAGE=E

NODE=M026R5;LINKAGE=A

$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\bar{K}\pi)$					$\Gamma_{21}/\Gamma_{17}$
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>0.477±0.017±0.070</b>	11k	1 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$	
1 We have multiplied the value of $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K_S^0 K^\pm \pi^\mp)$ reported in DEL-AMO-SANCHEZ 11M by a factor 1/3 to obtain $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\bar{K}\pi)$ . Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.					

$\Gamma(K^0K^-\pi^+\pi^-+\text{c.c.})/\Gamma_{\text{total}}$					$\Gamma_{22}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>5.6±1.4±0.5</b>	43	1,2 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^\mp \pi^\mp 2\pi^\pm$	
1 ABLIKIM 12N quotes $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K_S^0 K^- \pi^- 2\pi^+)$ $= (12.01 \pm 2.22 \pm 2.04) \times 10^{-6}$ which we multiply by 2 to take c.c. into account.					
2 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^0 K^- \pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (24.02 \pm 4.44 \pm 4.08) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(K^+K^-2(\pi^+\pi^-))/\Gamma_{\text{total}}$					$\Gamma_{23}/\Gamma$
VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>7.5±2.4 OUR AVERAGE</b> [(71 ± 29) × 10 <sup>-4</sup> OUR 2012 AVERAGE]					
8 ± 4 ± 1 10 1 ABLIKIM 12N BES3 $\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- 2(\pi^+ \pi^-)$					
7.1±2.4±1.6 100 2 ABLIKIM 06A BES2 $J/\psi \rightarrow K^+ K^- 2(\pi^+ \pi^-) \gamma$					
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (3.60 \pm 1.71 \pm 0.64) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (1.21 \pm 0.32 \pm 0.24) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(2(K^+K^-))/\Gamma_{\text{total}}$					$\Gamma_{24}/\Gamma$
VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>1.47±0.31 OUR FIT</b> [(1.34 ± 0.32) × 10 <sup>-3</sup> OUR 2012 FIT]					
<b>2.2 ± 0.9 OUR AVERAGE</b> [0.0015 ± 0.0007 OUR 2011 AVERAGE]					
<b>2.2 ± 0.9 ± 0.2</b> 7 1 ABLIKIM 12N BES3 $\psi(2S) \rightarrow \pi^0 \gamma 2(K^+ K^-)$					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.4 ± 0.5 ± 0.6 14.5 ± 4.6 2 HUANG 03 BELL $B^+ \rightarrow 2(K^+ K^-) K^+$					
21 ± 10 ± 6 3 ALBRECHT 94H ARG $\gamma\gamma \rightarrow K^+ K^- K^+ K^-$					
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(K^+ K^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (0.94 \pm 0.37 \pm 0.14) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .					
3 Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$ , $B(\eta_c \rightarrow \phi\phi)$ , $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$ , and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$ .					

$\Gamma(2(K^+K^-))/\Gamma(K\bar{K}\pi)$					$\Gamma_{24}/\Gamma_{17}$
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>0.020±0.004 OUR FIT</b> [0.019 ± 0.004 OUR 2012 FIT]					
<b>0.024±0.007 OUR AVERAGE</b>					
0.023±0.007±0.006 AUBERT,B 04B BABR $B^\pm \rightarrow K^\pm \eta_c$					
0.026 ± 0.009 ± 0.007 15 1 HUANG 03 BELL $B^\pm \rightarrow K^\pm (2K^+ 2K^-)$					
1 Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .					

NODE=M026R01  
NODE=M026R01

NODE=M026R01;LINKAGE=DE

NODE=M026R06  
NODE=M026R06

NODE=M026R06;LINKAGE=AA

NODE=M026R06;LINKAGE=AB

NODE=M026R23  
NODE=M026R23

NEW

NODE=M026R23;LINKAGE=AL

NODE=M026R20  
NODE=M026R20

NEW

NODE=M026R20;LINKAGE=AB

NODE=M026R20;LINKAGE=BB

NODE=M026R20;LINKAGE=AL

NODE=M026R38  
NODE=M026R38

NEW

NODE=M026R38;LINKAGE=BB

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$					$\Gamma_{25}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>4.7±0.9±0.4</b>	118	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma\pi^+\pi^-2\pi^0$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}}] = (20.31 \pm 2.20 \pm 3.33) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M026R07  
NODE=M026R07

NODE=M026R07;LINKAGE=AB

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$					$\Gamma_{26}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>0.97±0.12 OUR FIT</b>					
[(0.86 ± 0.13) × 10 <sup>-2</sup> OUR 2012 FIT]					
<b>1.35±0.21 OUR AVERAGE</b>					
[(1.15 ± 0.26) × 10 <sup>-2</sup> OUR 2012 AVERAGE]					
1.74±0.32±0.15	100	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 2(\pi^+\pi^-)$	
1.0 ± 0.5	542 ± 75	2 BAI	04 BES	$J/\psi \rightarrow \gamma 2(\pi^+\pi^-)$	
1.05±0.17±0.34	137	2 BISELLO	91 DM2	$J/\psi \rightarrow \gamma 2\pi^+2\pi^-$	
1.3 ± 0.6	25	2 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c\gamma$	
2.0 ± 1.5		3 HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c\gamma$	

NODE=M026R1  
NODE=M026R1

NEW

NEW

1 ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}}] = (7.51 \pm 0.85 \pm 1.11) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

2 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

3 Estimated using  $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = 0.0028 \pm 0.0006$ .

$\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}$					$\Gamma_{27}/\Gamma$
VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>17.4±2.9±1.5</b>	175	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 2(\pi^+\pi^-2\pi^0)$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}}] = (75.13 \pm 7.42 \pm 9.99) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M026R1;LINKAGE=AB

NODE=M026R1;LINKAGE=E

NODE=M026R1;LINKAGE=A

NODE=M026R08  
NODE=M026R08

NODE=M026R08;LINKAGE=AB

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$					$\Gamma_{28}/\Gamma$
VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>17 ± 4 OUR AVERAGE</b>					
[(150 ± 50) × 10 <sup>-4</sup> OUR 2012 AVERAGE]					
20 ± 5 ± 2	51	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma 3(\pi^+\pi^-)$	
15.2±3.3±3.4	479	2 ABLIKIM	06A BES2	$J/\psi \rightarrow 3(\pi^+\pi^-)\gamma$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}}] = (8.82 \pm 1.57 \pm 1.59) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (2.59 \pm 0.32 \pm 0.47) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M026R24  
NODE=M026R24

NEW

NODE=M026R24;LINKAGE=AL

NODE=M026R24;LINKAGE=AB

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$					$\Gamma_{29}/\Gamma$
VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>15.1± 1.6 OUR FIT</b>					
[(14.1 ± 1.7) × 10 <sup>-4</sup> OUR 2012 FIT]					
<b>13.2± 2.7 OUR AVERAGE</b>					

NODE=M026R2  
NODE=M026R2

NEW

NEW

$[(12.5 \pm 3.2) \times 10^{-4}$  OUR 2012 AVERAGE]

15 $\pm$ 5 $\pm$ 1	15	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p}$
15 $\pm$ 6	213 $\pm$ 33	2 BAI	04 BES	$J/\psi \rightarrow \gamma p\bar{p}$
10 $\pm$ 3 $\pm$ 4	18	2 BISELLO	91 DM2	$J/\psi \rightarrow \gamma p\bar{p}$
11 $\pm$ 6	23	2 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
29 $^{+29}_{-15}$	3 HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$14.8^{+2.0+1.7}_{-2.4-1.8}$	195	4 WU	06 BELL	$B^+ \rightarrow p\bar{p} K^+$
------------------------------	-----	------	---------	--------------------------------

<sup>1</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (0.65 \pm 0.19 \pm 0.10) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>2</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ . Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

<sup>3</sup> Estimated using  $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$ .

<sup>4</sup> WU 06 reports  $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (1.42 \pm 0.11^{+0.16}_{-0.20}) \times 10^{-6}$  which we divide by our best value  $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

### $\Gamma(p\bar{p})/\Gamma(K\bar{K}\pi)$

### $\Gamma_{29}/\Gamma_{17}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.0206 <math>\pm</math> 0.0021 OUR FIT</b> [ $0.0197 \pm 0.0022$ OUR 2012 FIT]				

<b>0.021 <math>\pm</math> 0.002 <math>^{+0.004}_{-0.006}</math></b>	195	1 WU	06 BELL	$B^\pm \rightarrow K^\pm p\bar{p}$
---	-----	------	---------	------------------------------------

<sup>1</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

### $\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\phi\phi)/\Gamma_{\text{total}}$

### $\Gamma_{29}/\Gamma \times \Gamma_7/\Gamma$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.27 <math>\pm</math> 0.05 OUR FIT</b> [ $(0.27 \pm 0.06) \times 10^{-5}$ OUR 2012 FIT]				

<b>4.0 <math>^{+3.5}_{-3.2}</math></b>		BAGLIN	89 SPEC	$\bar{p}p \rightarrow K^+ K^- K^+ K^-$
--	--	--------	---------	--

### $\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$

### $\Gamma_{30}/\Gamma$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.36 <math>\pm</math> 0.13 <math>\pm</math> 0.03</b>	14	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p}\pi^0$

<sup>1</sup> ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (1.53 \pm 0.49 \pm 0.23) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

### $\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

### $\Gamma_{31}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>10.9 <math>\pm</math> 2.4 OUR FIT</b>					

**11.7  $\pm$  3.5 OUR AVERAGE** [ $(10.4 \pm 3.1) \times 10^{-4}$  OUR 2011 AVERAGE]

**11.7  $\pm$  2.3  $\pm$  2.6** <sup>1</sup> ABLIKIM 12B BES3

• • • We do not use the following data for averages, fits, limits, etc. • • •

9.9 $^{+2.7}_{-2.6} \pm 1.2$	20	2 WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda} K^+$
------------------------------	----	------	---------	--

<20	90	3 BISELLO	91 DM2	$e^+ e^- \rightarrow \gamma \Lambda\bar{\Lambda}$
-----	----	-----------	--------	---

<sup>1</sup> ABLIKIM 12B reports  $[\Gamma(\eta_c(1S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (0.198 \pm 0.021 \pm 0.032) \times 10^{-4}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

2 WU 06 reports  $[\Gamma(\eta_c(1S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (0.95^{+0.25+0.08}_{-0.22-0.11}) \times 10^{-6}$  which we divide by our best value  $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>3</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$ .

NODE=M026R2;LINKAGE=AB

NODE=M026R2;LINKAGE=E

NODE=M026R2;LINKAGE=A

NODE=M026R2;LINKAGE=WU

NODE=M026R03  
NODE=M026R03  
NEW

NODE=M026R03;LINKAGE=BB

NODE=M026R33  
NODE=M026R33  
NEW

NODE=M026R09  
NODE=M026R09

NODE=M026R09;LINKAGE=AB

NODE=M026R18  
NODE=M026R18  
NEW

NODE=M026R18;LINKAGE=AB

NODE=M026R18;LINKAGE=WU

NODE=M026R18;LINKAGE=E

$\Gamma(\Lambda\bar{\Lambda})/\Gamma(p\bar{p})$ **0.72±0.16 OUR FIT****0.67<sup>+0.19</sup><sub>-0.16</sub>±0.12**

DOCUMENT ID

TECN COMMENT

 $\Gamma_{31}/\Gamma_{29}$ NODE=M026R27  
NODE=M026R271 WU 06 BELL  $B^+ \rightarrow p\bar{p}K^+, \Lambda\bar{\Lambda}K^+$ 1 Not independent from other  $\eta_c \rightarrow \Lambda\bar{\Lambda}$ ,  $p\bar{p}$  branching ratios reported by WU 06. $\Gamma(K\bar{K}\eta)/\Gamma_{\text{total}}$  $\Gamma_{32}/\Gamma$ VALUE (units  $10^{-2}$ ) CL% EVTS

DOCUMENT ID

TECN COMMENT

**1.0±0.5±0.1**

7

1,2 ABLIKIM

12N

BES3

 $\psi(2S) \rightarrow \pi^0\gamma\eta K^+K^-$ 

• • • We do not use the following data for averages, fits, limits, etc. • • •

<3.1 90 3 BALTRUSAIT..86 MRK3  $J/\psi \rightarrow \eta_c\gamma$ 1 ABLIKIM 12N quotes  $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma\eta_c) \cdot B(\eta_c \rightarrow K^+K^-\eta) = (12.01 \pm 2.22 \pm 2.04) \times 10^{-6}$  which we multiply by 2 to account for isospin symmetry.2 ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\eta)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.3 The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ . $\Gamma(\pi^+\pi^- p\bar{p})/\Gamma_{\text{total}}$  $\Gamma_{33}/\Gamma$ VALUE (units  $10^{-3}$ ) CL% EVTS

DOCUMENT ID

TECN COMMENT

**5.3±1.7±0.5**

19

1 ABLIKIM

12N

BES3

 $\psi(2S) \rightarrow \pi^0\gamma p\bar{p}\pi^+\pi^-$ 

• • • We do not use the following data for averages, fits, limits, etc. • • •

<12 90 HIMEL 80B MRK2  $\psi(2S) \rightarrow \eta_c\gamma$ 1 ABLIKIM 12N reports  $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^- p\bar{p})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (2.30 \pm 0.65 \pm 0.36) \times 10^{-6}$  which we divide by our best value  $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.**RADIATIVE DECAYS** $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$  $\Gamma_{34}/\Gamma$ VALUE (units  $10^{-4}$ ) CL% EVTS

DOCUMENT ID

TECN COMMENT

**1.57±0.12 OUR FIT**[(1.78 ± 0.16) × 10<sup>-4</sup> OUR 2012 FIT]**1.9<sup>+0.7</sup><sub>-0.6</sub> OUR AVERAGE**[(1.4<sup>+0.7</sup><sub>-0.6</sub>) × 10<sup>-4</sup> OUR 2012 AVERAGE]

2.6 ± 0.8 ± 0.6

1 ABLIKIM

13I

BES3

1.4<sup>+0.7</sup><sub>-0.5</sub> ± 0.31.2<sup>+2.8</sup><sub>-1.1</sub>

2 ADAMS

08

CLEO

 $\psi(2S) \rightarrow \pi^+\pi^- J/\psi$ 

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.3<sup>+1.0</sup><sub>-0.8</sub> ± 0.3

13

3 WICHT

08

BELL

 $B^\pm \rightarrow K^\pm\gamma\gamma$ 2.80<sup>+0.67</sup><sub>-0.58</sub> ± 1.0

4 ARMSTRONG

95F

E760

 $\bar{p}p \rightarrow \gamma\gamma$ < 9 90 5 BISELLO 91 DM2  $J/\psi \rightarrow \gamma\gamma\gamma$ 6<sup>+4</sup><sub>-3</sub> ± 4

4 BAGLIN

87B

SPEC

 $\bar{p}p \rightarrow \gamma\gamma$ < 18 90 6 BLOOM 83 CBAL  $J/\psi \rightarrow \eta_c\gamma$ 1 ABLIKIM 13I reports  $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (4.5 \pm 1.2 \pm 0.6) \times 10^{-6}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.2 ADAMS 08 reports  $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (2.4<sup>+1.1</sup><sub>-0.8</sub> \pm 0.3) \times 10^{-6}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.3 WICHT 08 reports  $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (2.2<sup>+0.9</sup><sub>-0.7</sub><sup>+0.4</sup>) \times 10^{-7}$  which we divide by our best value  $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M026R27

NODE=M026R27

NODE=M026R27;LINKAGE=WU

NODE=M026R15

NODE=M026R15

NODE=M026R15;LINKAGE=AK

NODE=M026R15;LINKAGE=AL

NODE=M026R15;LINKAGE=E

NODE=M026R3

NODE=M026R3

NODE=M026310

NODE=M026R31

NODE=M026R31

NEW

NEW

NODE=M026R31;LINKAGE=AL

NODE=M026R31;LINKAGE=AD

NODE=M026R31;LINKAGE=W1

<sup>4</sup> Not independent from the values of the total and two-photon width quoted by the same experiment.

<sup>5</sup> The quoted branching ratios use  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ .

<sup>6</sup> Using  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$ .

### $\Gamma(\gamma\gamma)/\Gamma(K\bar{K}\pi)$ $\Gamma_{34}/\Gamma_{17}$

VALUE (units $10^{-3}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
--------------------------	------	-------------	------	---------

#### **2.14±0.29 OUR FIT**

$[(2.5 \pm 0.4) \times 10^{-3}$  OUR 2012 FIT]

**3.2  $^{+1.3}_{-1.0}$   $^{+0.8}_{-0.6}$**  13 <sup>1</sup> WICHT 08 BELL  $B^\pm \rightarrow K^\pm \gamma\gamma$

<sup>1</sup> Using  $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$  from FANG 03 and  $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$ .

### $\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{29}/\Gamma \times \Gamma_{34}/\Gamma$

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
--------------------------	------	-------------	------	---------

#### **0.238±0.024 OUR FIT**

$[(0.250 \pm 0.026) \times 10^{-6}$  OUR 2012 FIT]

**0.26 ±0.05 OUR AVERAGE** Error includes scale factor of 1.4.

$0.224^{+0.038}_{-0.037} \pm 0.020$	190	AMBROGIANI 03	E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
$0.336^{+0.080}_{-0.070}$		ARMSTRONG 95F	E760	$\bar{p}p \rightarrow \gamma\gamma$
$0.68^{+0.42}_{-0.31}$	12	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$

### — Charge conjugation (C), Parity (P), — — Lepton family number (LF) violating modes —

### $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ $\Gamma_{35}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
--------------------------	-----	-------------	------	---------

**<11** 90 <sup>1</sup> ABLIKIM 11G BES3  $J/\psi \rightarrow \gamma\pi^+\pi^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<60 90 <sup>2</sup> ABLIKIM 06B BES2  $J/\psi \rightarrow \pi^+\pi^-\gamma$

<sup>1</sup> ABLIKIM 11G reports  $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 1.82 \times 10^{-6}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

<sup>2</sup> ABLIKIM 06B reports  $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 1.1 \times 10^{-5}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

### $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$ $\Gamma_{36}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
--------------------------	-----	-------------	------	---------

**< 3.5** 90 <sup>1</sup> ABLIKIM 11G BES3  $J/\psi \rightarrow \gamma\pi^0\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<40 90 <sup>2</sup> ABLIKIM 06B BES2  $J/\psi \rightarrow \pi^0\pi^0\gamma$

<sup>1</sup> ABLIKIM 11G reports  $[\Gamma(\eta_c(1S) \rightarrow \pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 6.0 \times 10^{-7}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

<sup>2</sup> ABLIKIM 06B reports  $[\Gamma(\eta_c(1S) \rightarrow \pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 0.71 \times 10^{-5}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

### $\Gamma(K^+K^-)/\Gamma_{\text{total}}$ $\Gamma_{37}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
--------------------------	-----	-------------	------	---------

**<60** 90 <sup>1</sup> ABLIKIM 06B BES2  $J/\psi \rightarrow K^+K^-\gamma$

<sup>1</sup> ABLIKIM 06B reports  $[\Gamma(\eta_c(1S) \rightarrow K^+K^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 0.96 \times 10^{-5}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

### $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$ $\Gamma_{38}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
--------------------------	-----	-------------	------	---------

**<31** 90 <sup>1</sup> ABLIKIM 06B BES2  $J/\psi \rightarrow K_S^0 K_S^0 \gamma$

<sup>1</sup> ABLIKIM 06B reports  $[\Gamma(\eta_c(1S) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] < 0.53 \times 10^{-5}$  which we divide by our best value  $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$ .

NODE=M026R31;LINKAGE=AB

NODE=M026R31;LINKAGE=E

NODE=M026R31;LINKAGE=C

NODE=M026R04

NODE=M026R04

NEW

NODE=M026R04;LINKAGE=BB

NODE=M026R32

NODE=M026R32

NEW

NODE=M026320

NODE=M026R34

NODE=M026R34

NODE=M026R34;LINKAGE=AL

NODE=M026R34;LINKAGE=AB

NODE=M026R35

NODE=M026R35

NODE=M026R35;LINKAGE=AL

NODE=M026R35;LINKAGE=AB

NODE=M026R36

NODE=M026R36

NODE=M026R36;LINKAGE=AB

NODE=M026R37

NODE=M026R37

NODE=M026R37;LINKAGE=AB

**$\eta_c(1S)$  REFERENCES**

NODE=M026

ABLIKIM	13I	PR D87 032003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54954
ABLIKIM	12B	PR D86 032008	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54267
ABLIKIM	12F	PRL 108 222002	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54271
ABLIKIM	12N	PR D86 092009	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54741
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Collab.)	REFID=54303
ABLIKIM	11G	PR D84 032006	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53711
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=16751
VINOKUROVA	11	PL B706 139	A. Vinokurova <i>et al.</i>	(BELLE Collab.)	REFID=53927
LEES	10	PR D81 052010	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53236
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)	REFID=52676
ADAMS	08	PRL 101 101801	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=52261
AUBERT	08AB	PR D78 012006	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52267
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=52064
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52204
ABE	07	PRL 98 082001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=51627
ABLIKIM	06A	PL B633 19	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50987
ABLIKIM	06B	EPJ C45 337	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50988
AUBERT	06E	PRL 96 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51059
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)	REFID=51004
WU	06	PRL 97 162003	C.-H. Wu <i>et al.</i>	(BELLE Collab.)	REFID=51472
ABLIKIM	05L	PR D72 072005	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50837
KUO	05	PL B621 41	C.C. Kuo <i>et al.</i>	(BELLE Collab.)	REFID=50801
ABE	04G	PR D70 071102	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=50182
ABLIKIM	04M	PR D70 112008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50329
ASNER	04	PRL 92 142001	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=49745
AUBERT	04D	PRL 92 142002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=49746
AUBERT,B	04B	PR D70 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50043
BAI	04	PL B578 16	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49620
ABDALLAH	03J	EPJ C31 481	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49625
AMBROGIANI	03	PL B566 45	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=49465
BAI	03	PL B555 174	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49185
FANG	03	PRL 90 071801	F. Fang <i>et al.</i>	(BELLE Collab.)	REFID=49206
HUANG	03	PRC 91 241802	H.-C. Huang <i>et al.</i>	(BELLE Collab.)	REFID=49621
ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=49188
BAI	00F	PR D62 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=48546
BRANDENB...	00B	PRL 85 3095	G. Brandenburg <i>et al.</i>	(CLEO Collab.)	REFID=48553
ACCIARRI	99T	PL B461 155	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=47476
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47385
ABREU	98O	PL B441 479	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=46553
SHIRAI	98	PL B424 405	M. Shirai <i>et al.</i>	(AMY Collab.)	REFID=46381
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong <i>et al.</i>	(FNAL, FERM, GENO+)	REFID=44623
ALBRECHT	94H	PL B338 390	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=44098
ADRIANI	93N	PL B318 575	O. Adriani <i>et al.</i>	(L3 Collab.)	REFID=43670
BISELLO	91	NP B350 1	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=41668
BAI	90B	PRL 65 1309	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41354
CHEN	90B	PL B243 169	W.Y. Chen <i>et al.</i>	(CLEO Collab.)	REFID=41360
BAGLIN	89	PL B231 557	C. Baglin, S. Baird, G. Bassompierre	(R704 Collab.)	REFID=41015
BEHREND	89	ZPHY C42 367	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=40732
BRAUNSCH...	89	ZPHY C41 533	W. Braunschweig <i>et al.</i>	(TASSO Collab.)	REFID=40728
AIHARA	88D	PRC 60 2355	H. Aihara <i>et al.</i>	(TPC Collab.)	REFID=40588
BAGLIN	87B	PL B187 191	C. Baglin <i>et al.</i>	(R704 Collab.)	REFID=40018
BALTRUSAIT...	86	PR D33 629	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=22009
BERGER	86	PL 167B 120	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=22010
GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
ALTHOFF	85B	ZPHY C29 189	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=21349
BALTRUSAIT...	84	PRL 52 2126	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+) JP	REFID=22006
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)	REFID=21682
HIMEL	80B	PRL 45 1146	T.M. Himel <i>et al.</i>	(SLAC, LBL, UCB)	REFID=22003
PARTRIDGE	80B	PRL 45 1150	R. Partridge <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22004